Precision Measurement Central (2)

Part 2: printed circuit board and software suite

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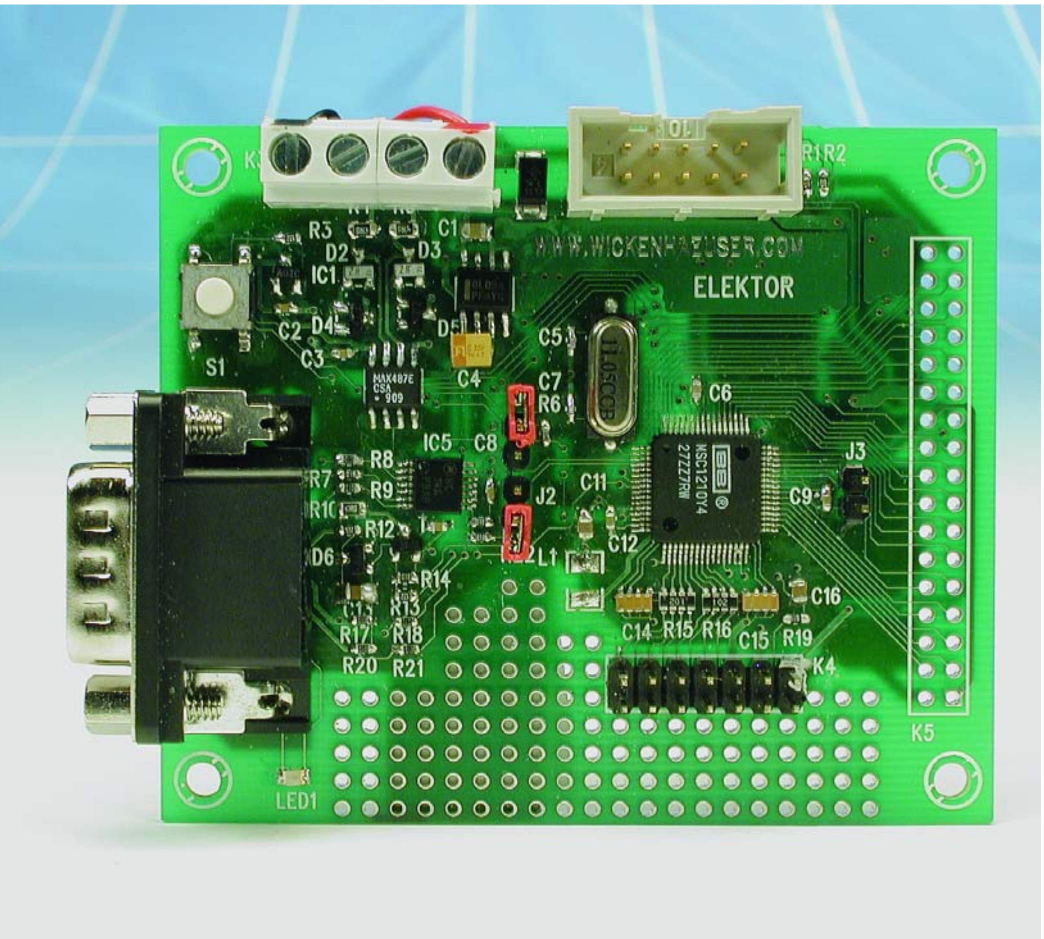
The solid base of the Precision Measurement Central (or 'Elektor Meter') is the powerful MSC1210 development system and an I^2C LC display unit described elsewhere in this issue. This base and the software suite described this month will be used in a number of future projects employing the highly interesting MSC1210 microcontroller.



First, however, we need to 'wrap up' the hardware side of things. In the previous issue (July/August 2003) we discussed the operation of the MSC1210 controller board along the lines of its circuit diagram. For lack of space in the first instalment we could not include the layout of the double-sided printed circuit board and the associated component lists. With a 'thank you for your patience' to many dedicated readers we can now print these two items, see **Figure 1**.

As already announced in the July/August 2003 issue, the board we're talking about is not available unstuffed from the Publishers. The good news is that the MSC1210 controller board (as shown on the photograph) comes **ready-populated and tested**. The photo tells you why: the risk of construction errors using tiny parts, an extremely condensed board layout and kitchen table methods to populate the board is immense!

Industrially manufactured MSC1210 controller boards are available through Elektor's Readers Services under number **030060-91** (see

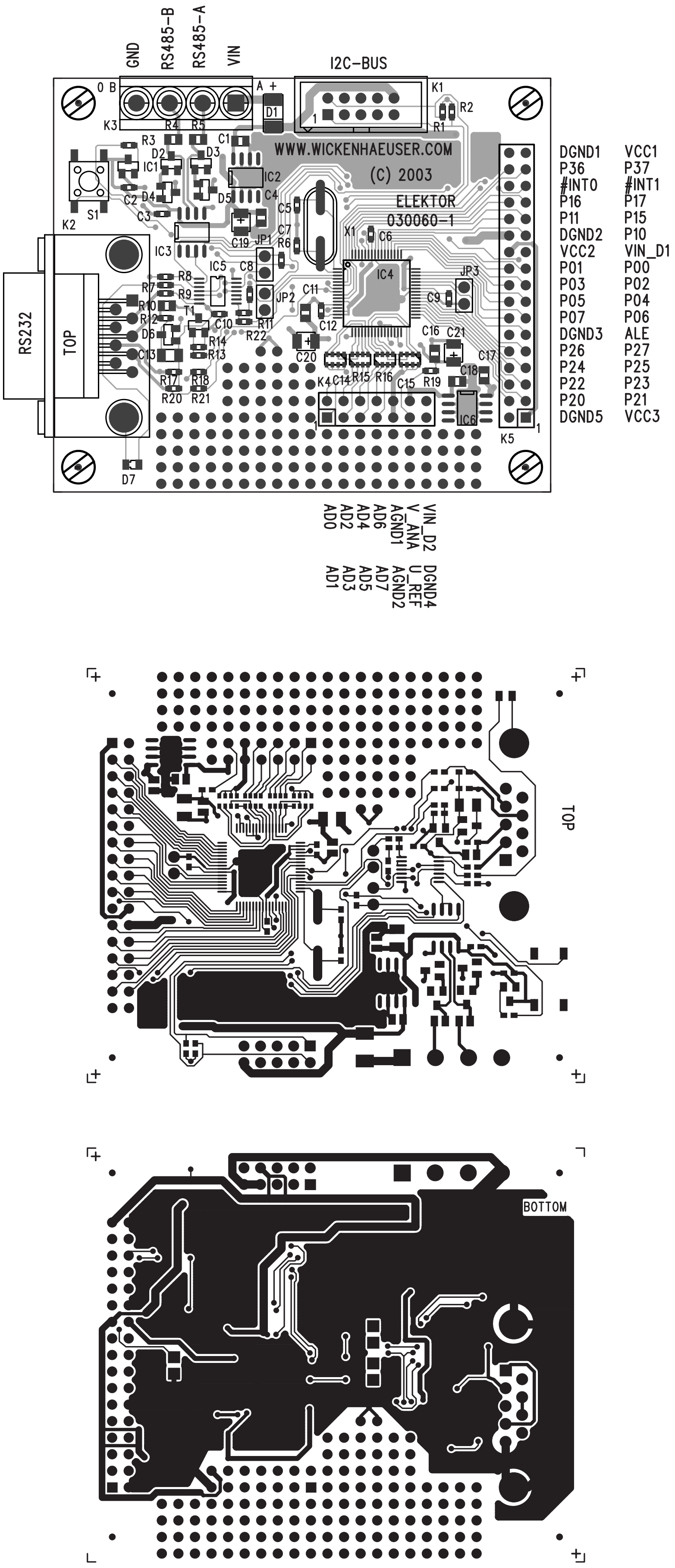


Figure 1. Artwork for the double-sided, SMD populated board.

also our website www.elektor-electronics.co.uk). However, in good Elektor tradition, the PCB layouts are available as a Free Download for those of you having the SMD components, equipment and where-withal to attempt home construction.

Besides the MSC1210 board, the system hardware only comprises a zero-modem

COMPONENTS LIST

All parts: SMD [shape code]

Resistors:

R1,R2,R3,R12,R13 = 4kΩ7 [0603]
R4,R5,R10 = 47Ω [0805]
R6,R7,R11,R14 = 1kΩ [0603]
R8,R9,R17,R18,R20,R21 = 100kΩ [0603]
R15,R16 = 4 x 1kΩ [1206], resistor array
R19 = 10Ω [0603]

Capacitors:

C1,C4,C11,C16,C17,C18 = 470nF [0805], V≥ 16V
C2,C3,C6,C9,C10,C12 = 100nF [0603]
C5,C7 = 10pF [0603]
C8 = 1nF [0603]
C13 = 2µF2 [1206], V≥ 16V
C14,C15 = 4 x 100nF (or 47nF) [1206], capacitor array
C19,C20,C21 = 10µF 6V3

Inductor:

L1 = 100µH [1206] Rd < 10Ω

Semiconductors:

D1 = GF1M [DO214]
D2,D3 = BZX84 [SOT23], 9V1
D4,D5 = BZX84 [SOT23], 4V7
D6 = BAW56 [SOT23]
D7 = LED, red, [0805]
T1 = BC857B
IC1 = MAX810 or similar
IC2,IC61 = 78L05 [SO8]
IC3 = MAX 487ECSA, 485, SN75176 or equivalent RS485 converter
IC4 = MSC1210 Y4 (Texas Instruments)
IC5 = 74HC14ADT [TSSOP14]

Miscellaneous:

K1 = 10-way boxheader
K2 = 9-way sub-D plug (male), angled, PCB mount
K3 = 4-way PCB terminal block, lead pitch 5mm
K4 = 14-way pinheader (2 rows)
K5 = 34-way pinheader (2 rows)
J1,J2,J3 = jumper, 2-way, lead pitch 5mm
X1 = 11.0592MHz quartz crystal, miniature
S1 = SMD pushbutton
Order code for ready-stuffed and tested board: 030060-91.

RS232 cable, a mains adapter (o/p 7.5-15 V direct voltage) and, of course, a PC. The LC display described elsewhere in this issue is not strictly necessary, although it is used by a number of C demo programs. In all cases, text can be sent via the RS232 path to a terminal (emulation) program running on the PC.

Software

Specially for constructors of the MSC1210 Precision Measurement Central, the author has bundled a number of software utilities into an MSC1210 'suite', containing all available documentation, compilers, downloaders, programs and source code files. To be able to use these 'tidbits' on your PC you'll need to have WinZip (to extract the files from a large archive) and a PDF viewer like Acrobat Reader. Both are commonplace programs these days and should be available on most PCs. If not, they are available free of charge on the web. The same goes for the archive file **030060-11** which may be found in this month's Free Downloads section of the *Elektor Electronics* website. The directory structure is illustrated in **Figure 2**, while the function of the folders and files is explained in **Table 1**.

Installation

Having read the ReadMe file you are ready to install the software required for a Windows PC.

It is best to begin with the file uC51_Inst.EXE which not only contains the C compiler proper, but also the compiler reference manual, source codes and datasheets for the controller board, the Precision Measurement Central ('Elektor Meter') and the LC display.

A Downloader utility is required any time you want to blow a project into the MSC1210 micro. For your first attempts, we recommend the original Texas Instruments downloader contained in the file **DownloaderVxxx.zip**. Advanced users may prefer Robin Kucera's **MSCLoader.exe**.

The 'ADC Demo' from TI discussed in part 1 of this article makes an excellent introduction into MSC1210 architecture, programming and downloading. The program may be extracted from the archive file **ADC Demoxxx.zip**, which, in turn, is contained in the larger archive.

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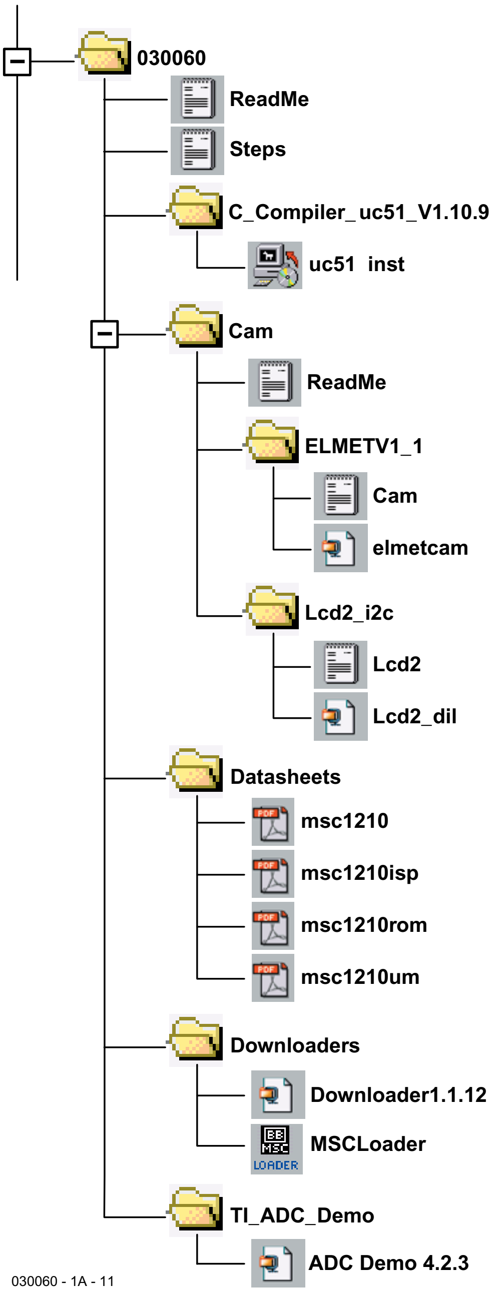

Figure 2. Directory structure of the software suite developed for the MSC1210 system.

Table 1

Directory structure (ref. Figure 2).

1	ReadMe.TXT	MUST be loaded first
2	Steps.TXT	This text (English)
3	C Compiler uC/51_Vxxx\	C Compiler directory
4	uC5_Inst.EXE	Code optimizing ANSI C Compiler uC/5 (8-kB demo version)
5		All source code files and additional documents
6	CAM\	CAM data directory (create when erased)
7	ElmetV1_1\	Elektor Meter subdirectory
8	CAM.TXT	Information on producing PCBs
9	ELMETCAM.ZIP	All PCB data for the Elektor Meter
10	LCD_I2C\	I2C LC Display subdirectory (author's SMD version)
11	CAM.TXT	Information on producing PCBs
12	LCD2_DIL.ZIP	All PCB data for the I2C LC Display (author's DIL version, not published in Elektor)
13	DATASHEETS\	Quick reference material on MSC1210
14	MSC1210.PDF	MSC1210 datasheet
15	MSC1210ISP.PDF	ISP manual (not applicable when using a Downloader)
16	MSC1210ROM.PDF	MSC1210-API (TI's built-in functions)
17	MSC1210UM.PDF	Craig Steiner MSC121x-Family User Manual
18	DOWNLOADERS	Downloader directory
19	DownloaderVxxx.ZIP	Original TI Downloader
20	MSCLoader.EXE	Robin Kucera's Downloader
21	TI_ADC_DEMO\	TI's ADC-Demo directory
22	ADC_Demoxxx.ZIP	Compressed program file for ADC Demo